

# **Missouri Department of Health**

## **Hazardous Substances Emergency Events Surveillance (HSEES) Program**



**1994 - 1998 Data Analysis**

September 2000

# **Missouri Department of Health Hazardous Substances Emergency Events Surveillance 1994 - 1998 Data Analysis**

## **INTRODUCTION**

The Missouri Department of Health has participated in the Hazardous Substances Emergency Events Surveillance (HSEES) program since October 1, 1993. This program, established in 1990 by the Agency for Toxic Substances and Disease Registry (ATSDR), collects information from Missouri and 14 other participating states on the public health impact of emergency events involving hazardous substances. Information in this report is based on events that occurred from January 1, 1994 through December 31, 1998. Data collected from October 1, 1993 through December 31, 1993 have been designated as pilot data by ATSDR and are not included in this cumulative report.

The purpose of the HSEES program is to monitor hazardous substances emergency events to better understand the public health impact, and to develop prevention strategies to reduce morbidity and mortality. Knowledge of the substances released and the injuries most often sustained by victims of hazardous substances emergency events can provide facility managers, employees, responders, health care providers and planners with information to assist in managing and preventing future releases. In cases where development of intervention strategies might prevent similar incidents, specific summary investigation reports are prepared and distributed to the community involved. When appropriate, health education programs to promote prevention strategies are conducted for the industry, local emergency planning committees, emergency responders and the general public.

Missouri's HSEES program receives notifications of incidents involving hazardous substances from several sources, including the Missouri Department of Natural Resources' Environmental Services Program, the United States Coast Guard's National Response Center, the federal Department of Transportation's Hazardous Materials Information System, the Missouri State Highway Patrol, and the media. Information about specific hazardous substance emergency events is obtained from the Missouri Departments of Agriculture, Conservation, Public Safety, and Highway and Transportation, as well as regional environmental agencies, local public health agencies, responders, incident commanders, responsible parties, facility and transportation managers, hospitals, employees, witnesses and victims.

As we continue in the seventh year of data collection, new notification and data sources are being developed. Information collected by the program is being analyzed and shared with chemical facilities and transporters, hospitals, police and fire departments, hazardous materials (HAZMAT) teams, local public health agencies, and members of the general public to increase awareness of the program and the impact of hazardous substance releases in the state. Prevention strategies to reduce the number of events and injuries are being implemented and will be targeted to employees, responders and the general public.

## **METHODS**

### **Definition of a Reportable Event**

A hazardous substance event is entered in the HSEES system if it meets the following criteria:

1. An uncontrolled or illegal release or threatened release of one or more hazardous substances; and
2. The substances that are actually released or threatened to be released include ALL hazardous substances except petroleum products; and
3. The quantities of the hazardous substances that are released, or are threatened to be released, need (or would need) to be removed, cleaned up, or neutralized according to federal, state or local law; or
4. Only a threatened release of hazardous substances exists, but this threat leads to an action such as an evacuation that can potentially impact on the health of employees, responders, or the general public. This action makes the event eligible for inclusion in the surveillance system even though the hazardous substances are not released.

An event is considered an actual and threatened release when only a small amount of the substance is spilled but a public health action, such as evacuation, is prompted because a substantially larger amount of the same substance, or another substance, is threatened to be released.

### **Definition of Fixed-Facility and Transportation Events**

Fixed-facility events are those which occur outdoors or inside a building on the premises of a facility or site. Some examples of fixed facilities are industrial sites, manufacturing plants, businesses, farms, schools, hospitals and private residences. Transportation events involve ground, rail, water, air or pipeline transport, and may occur inside or outside the boundaries of a fixed facility. (For example, an event occurring during off-loading of a transport truck at a fixed facility would be considered a transportation event.)

### **Data Collection Methods**

Information received from the various reporting agencies is reviewed and used to complete the 68 questions on the surveillance form developed by ATSDR (OMB 0923-0008). Information collected includes the time, date and location of the event; type and quantity of chemical involved; factors contributing to the release; injuries and evacuations; potential exposure to residents and employees; and control measures. Additional information is obtained from interviews with first responders, state and federal environmental staff, plant managers and employees, and others involved in the incident. This information is entered into the HSEES database and transmitted to ATSDR. Review and analysis of the data is conducted on a continuing basis.

## Analysis of Data on Hazardous Substances Emergency Events

During the five-year report period, 1,071 incidents met the hazardous substances emergency event case definition. Of these events, 676 (63.1%) occurred in fixed facilities, while 395 (36.9%) were transportation related (Table 1). A total of 906 events (84.6%) occurred on weekdays and 165 (15.4%) occurred on weekends (Table 2).

**Table 1**  
**Number of Events Meeting the Surveillance Definition by Type of Event**  
**Missouri 1994 - 1998**

Year	TYPE OF EVENT				Total No. of Events
	Fixed-Facility		Transportation		
	No. of Events	%	No. of Events	%	
1994	137	67.2	67	32.8	204
1995	172	52.4	156	47.6	328
1996	109	68.1	51	31.9	160
1997	113	61.7	70	38.3	183
1998	145	74.0	51	26.0	196
Total	676	63.1	395	36.9	1,071

**Table 2**  
**HSEES Events by Day of the Week**  
**Missouri 1994 - 1998**

Day	1994	%	1995	%	1996	%	1997	%	1998	%	Total
Monday	36	17.6	44	13.4	31	19.4	26	14.2	39	19.9	176
Tuesday	33	16.2	57	17.4	28	17.5	31	16.9	34	17.3	183
Wednesday	37	18.1	51	15.5	25	15.6	32	17.5	42	21.4	187
Thursday	41	20.1	61	18.6	32	20.0	30	16.4	30	15.3	194
Friday	28	13.7	59	18.0	23	14.4	31	16.9	25	12.8	166
Saturday	14	6.9	28	8.5	9	5.6	17	9.3	13	6.6	81
Sunday	15	7.4	28	8.5	12	7.5	16	8.7	13	6.6	84
Total *	204	100.0	328	99.9	160	100.0	183	99.9	196	99.9	1,071
Weekday	175	85.7	272	83.2	139	86.2	150	82.0	170	86.7	906
Weekend	29	14.3	56	16.8	21	13.8	33	18.0	26	13.3	165

\* Percentage may not equal 100.0 due to rounding to the nearest decimal point

Events were scattered throughout the state, occurring in 100 (87.7%) of the 114 counties and St. Louis City (Figure 1). Events occurred primarily in counties where there are larger cities, interstate highways, and large manufacturing or mining facilities.

**Figure 1. Number of HSEES events by county, Missouri 1994-1998.**

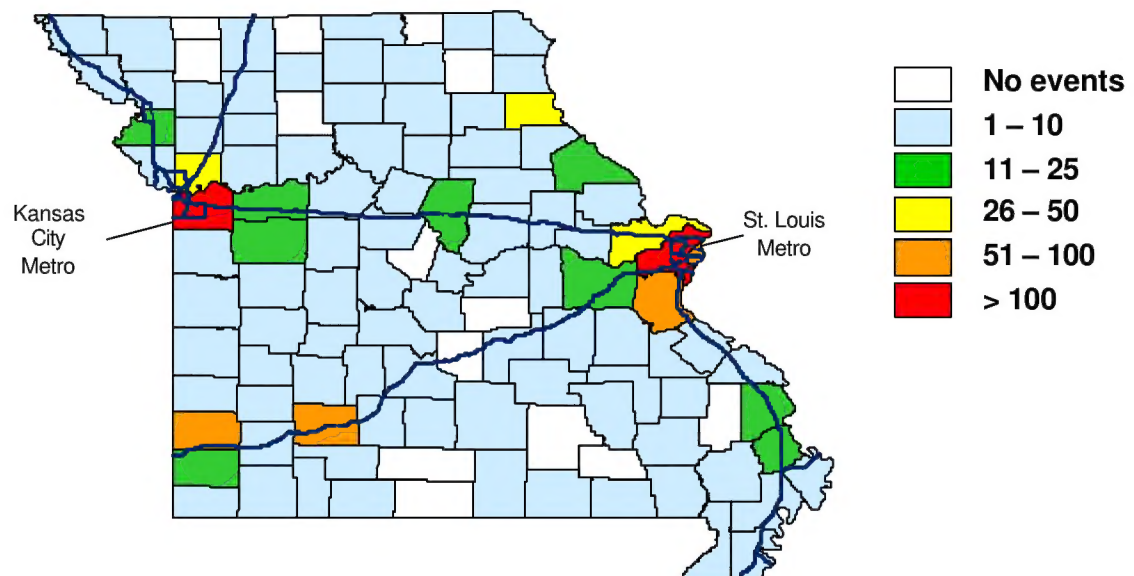


Table 3 shows the 10 counties (including St. Louis City) that had the highest five-year total number of events. Seven of the 10 counties are adjacent to or are included in a major metropolitan area. These seven counties accounted for 553 (51.6%) of the 1,071 total events statewide. Three non-metropolitan counties in the top 10 (Jasper, Marion and Boone) accounted for 115 (10.7%) events.

**Table 3**  
**Ten Counties with the Highest Five-Year Total Number of Events**  
**Missouri 1994 - 1998**

County	1994	1995	1996	1997	1998	Total	Metro Area
St. Louis	39	74	15	24	21	173	St. Louis
Jackson	11	40	22	20	19	112	Kansas City
St. Louis City	13	23	10	18	18	82	St. Louis
Greene	14	26	6	7	7	60	Springfield
Jefferson	9	12	10	9	15	55	St. Louis
Jasper	12	12	14	8	8	54	N/A
St. Charles	17	16	3	2	4	42	St. Louis
Marion	9	14	4	7	4	38	N/A
Clay	4	6	8	7	4	29	Kansas City
Boone	4	7	4	2	6	23	N/A

While many of the fixed-facility events (221, or 32.7%) were due to equipment failure, 94 (13.9%) were due to operator error, and 17 (2.5%) were due to improper filling/overfilling of chemical containers (Table 4). The contributing factor was not known in 98 (14.5%) events. (Data on contributing factors was not collected until July 1995.)

**Table 4**  
**Factors Contributing to the Occurrence of Fixed-Facility Events**  
**Missouri 1994 - 1998**

<b>Factors</b>	<b>1994</b>	<b>%</b>	<b>1995</b>	<b>%</b>	<b>1996</b>	<b>%</b>	<b>1997</b>	<b>%</b>	<b>1998</b>	<b>%</b>	<b>Total</b>
<b>Equipment failure</b>	0	0.0	42	24.4	62	56.9	53	46.9	64	44.1	<b>221</b>
<b>Operator error</b>	0	0.0	33	19.2	9	8.3	13	11.5	39	26.9	<b>94</b>
<b>Improper filling</b>	0	0.0	3	1.7	7	6.4	3	2.7	4	2.8	<b>17</b>
<b>Factors beyond human control</b>	0	0.0	0	0.0	0	0.0	0	0.0	8	5.5	<b>8</b>
<b>Unauthorized dumping</b>	0	0.0	0	0.0	0	0.0	0	0.0	8	5.5	<b>8</b>
<b>Deliberate damage</b>	0	0.0	0	0.0	0	0.0	0	0.0	8	5.5	<b>8</b>
<b>Improper mixing</b>	0	0.0	0	0.0	1	0.9	2	1.8	1	0.7	<b>4</b>
<b>System upset</b>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.7	<b>1</b>
<b>Other factors</b>	0	0.0	0	0.0	1	0.9	0	0.0	1	0.7	<b>2</b>
<b>Unknown</b>	0	0.0	16	9.3	29	26.6	42	37.2	11	7.6	<b>98</b>
<b>Not collected</b>	137	100.0	78	45.3	0	0.0	0	0.0	0	0.0	<b>215</b>
<b>Total *</b>	<b>137</b>	<b>100.0</b>	<b>172</b>	<b>99.9</b>	<b>109</b>	<b>100.0</b>	<b>113</b>	<b>100.1</b>	<b>145</b>	<b>100.0</b>	<b>676</b>

\* Percentage may not equal 100.0 due to rounding to the nearest decimal point

The most common areas involved in fixed-facility events (Table 5) include above ground storage (147 events, or 21.7%) and piping (125 events, or 18.5%). The 80 events coded as "other" (11.8%) involved areas such as roadsides, private residences, classrooms, laboratories, and clinics.



**Table 5**  
**Areas of Fixed Facilities Involved in Events**  
**Missouri 1994 - 1998**

<b>Area Type</b>	<b>1994</b>	<b>%</b>	<b>1995</b>	<b>%</b>	<b>1996</b>	<b>%</b>	<b>1997</b>	<b>%</b>	<b>1998</b>	<b>%</b>	<b>Total</b>
Storage above ground	32	23.4	36	20.9	28	25.7	34	30.1	17	11.7	147
Piping	27	19.7	37	21.5	21	19.3	15	13.3	25	17.2	125
Process vessel	12	8.8	12	7.0	12	11.0	9	8.0	26	17.9	71
Material handling	16	11.7	28	16.3	7	6.4	9	8.0	10	6.9	70
Combination	12	8.8	12	7.0	4	3.7	4	3.5	16	11.0	48
Ancillary process equip.	5	3.6	18	10.5	6	5.5	7	6.2	7	4.8	43
Transformer	4	2.9	8	4.7	8	7.3	9	8.0	6	4.1	35
Dump/waste area	5	3.6	8	4.7	4	3.7	3	2.7	9	6.2	29
Unknown	0	0.0	2	1.2	7	6.4	4	3.5	2	1.4	15
Transport in facility	1	0.7	2	1.2	2	1.8	0	0.0	2	1.4	7
Storage below ground	1	0.7	0	0.0	1	0.9	0	0.0	1	0.7	3
Building heating/cooling	0	0.0	0	0.0	0	0.0	0	0.0	2	1.4	2
Incinerator	1	0.7	0	0.0	0	0.0	0	0.0	0	0.0	1
Other	21	15.3	9	5.2	9	8.3	19	16.8	22	15.2	80
<b>Total *</b>	<b>137</b>	<b>99.9</b>	<b>172</b>	<b>100.2</b>	<b>109</b>	<b>100.0</b>	<b>113</b>	<b>100.1</b>	<b>145</b>	<b>99.9</b>	<b>676</b>

Ground transportation (transport by truck, van or tractor) accounted for 337 (85.3%) transportation related events during the five-year period (Table 6). Rail transportation accounted for 48 (12.2%) events. The remaining transport types were involved in only 10 (2.5%) of the total transportation events during this period.

**Table 6**  
**Transportation Related Events by Type of Transport**  
**Missouri 1994 - 1998**

<b>Transport Type</b>	<b>1994</b>	<b>%</b>	<b>1995</b>	<b>%</b>	<b>1996</b>	<b>%</b>	<b>1997</b>	<b>%</b>	<b>1998</b>	<b>%</b>	<b>Total</b>
Ground	54	80.6	146	93.6	40	78.4	55	78.6	42	82.4	337
Rail	9	13.4	8	5.1	10	19.6	12	17.1	9	17.6	48
Pipeline	1	1.5	1	0.6	1	2.0	3	4.3	0	0.0	6
Water	2	3.0	1	0.6	0	0.0	0	0.0	0	0.0	3
Air	1	1.5	0	0.0	0	0.0	0	0.0	0	0.0	1
<b>Total *</b>	<b>67</b>	<b>100.0</b>	<b>156</b>	<b>99.9</b>	<b>51</b>	<b>100.0</b>	<b>70</b>	<b>100.0</b>	<b>51</b>	<b>100.0</b>	<b>395</b>

\* Percentage may not equal 100.0 due to rounding to the nearest decimal point

## SUBSTANCES

During the five-year report period, 1,060 (99.0%) events involved the actual release of one or more hazardous substances. The majority of these events (985, or 92.9%) involved the release of only one substance (Table 7). Table 8 shows the distribution of the number of substances released, by substance category and type of event, during the five-year report period.

**Table 7**  
**Number of Substances Released Per Event \***  
**Missouri 1994 – 1998**

No. of Substances Released	TYPE OF EVENT						All Events		
	Fixed-Facility			Transportation					
	No. of Events	%	No. of Substances	No. of Events	%	No. of Substances	No. of Events	%	No. of Substances
1	623	92.8	623	362	93.1	362	985	92.9	985
2	39	5.8	78	18	4.6	36	57	5.4	114
3	4	0.6	12	6	1.5	18	10	0.9	30
4	1	0.2	4	3	0.8	12	4	0.4	16
5	1	0.2	5	0	0.0	0	1	0.1	5
≥ 6	3	0.4	29	0	0.0	0	3	0.3	29
Total	671	100.0	751	389	100.0	428	1,060	100.0	1,179

**Table 8**  
**Number of Substances Released by Substance Category and Type of Event \***  
**Missouri 1994 – 1998**

Substance Category	TYPE OF EVENT				All Events	
	Fixed-Facility		Transportation			
	No. of Substances	%	No. of Substances	%	No. of Substances	%
Acids	80	10.7	55	12.9	135	11.4
Ammonia	114	15.2	22	5.1	136	11.5
Bases	22	2.9	23	5.4	45	3.8
Chlorine	14	1.9	0	0.0	14	1.2
Mixtures **	40	5.3	27	6.3	67	5.7
Other inorganic substances	124	16.5	76	17.8	200	17.0
Other substances	149	19.8	115	26.9	264	22.4
Paints and dyes	24	3.2	18	4.2	42	3.6
Pesticides	62	8.3	51	11.9	113	9.6
Polychlorinated biphenyls	43	5.7	4	0.9	47	4.0
Volatile organic compounds	79	10.5	37	8.6	116	9.8
Total ***	751	100.0	428	100.0	1,179	100.0

\* Does not include threatened only events, as no substances were actually released during these events

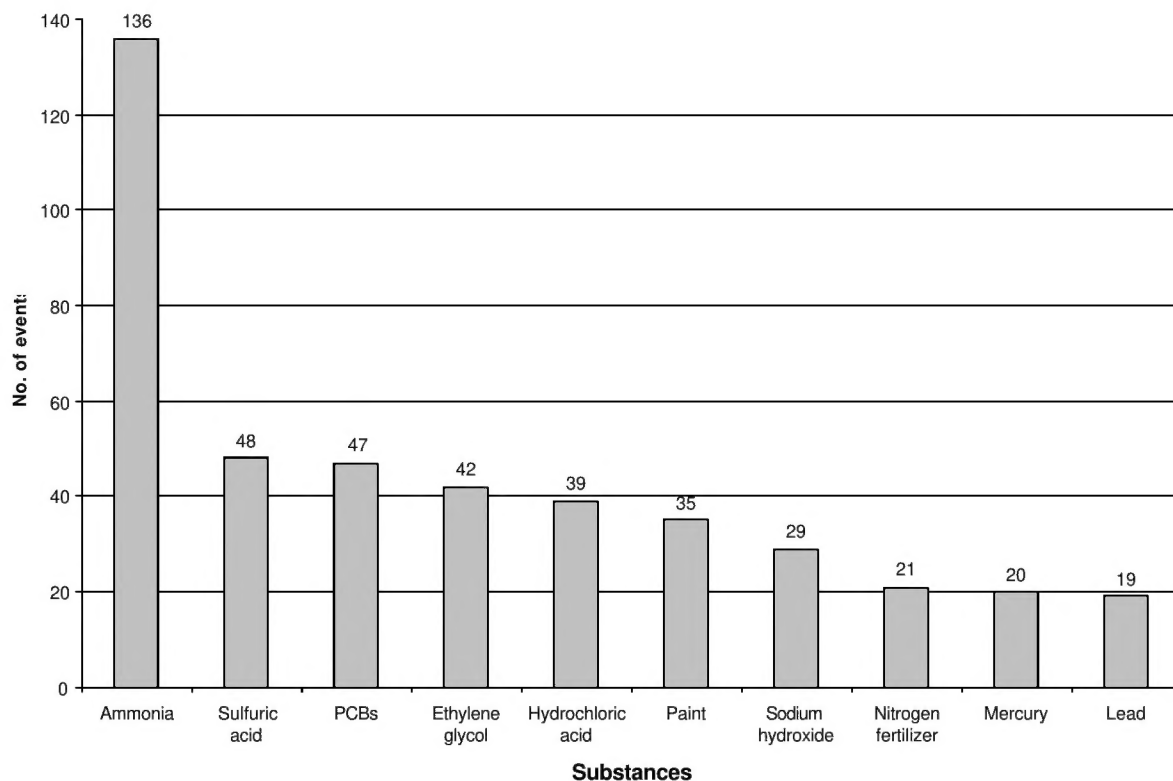
\*\* Mixtures of substances from different categories

\*\*\* Exceeds total number of events with releases (1,060) because some events involved the release of more than one substance

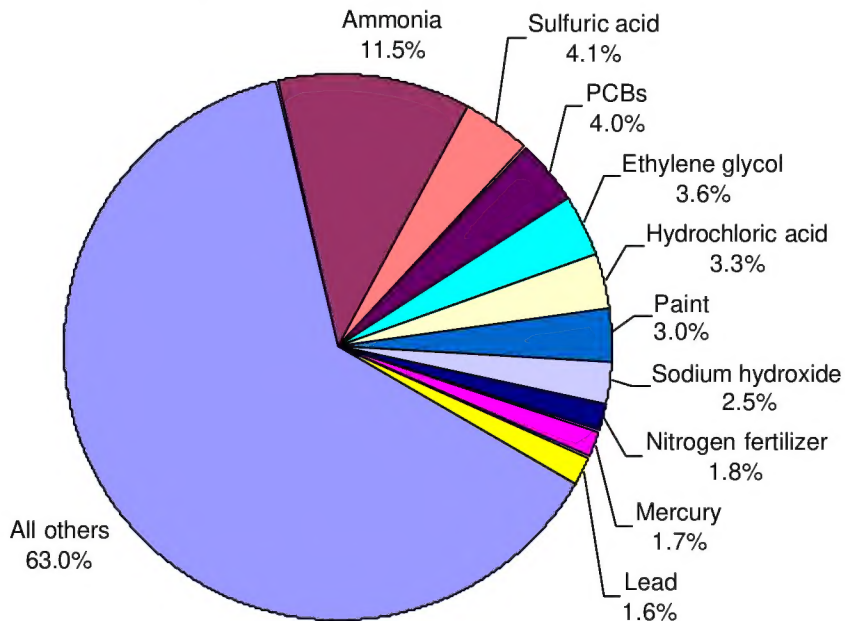


The individual substance released most frequently during the five-year report period (Figures 2 and 3) was ammonia, accounting for 136 (11.5%) of the 1,179 substances released. Other commonly released individual substances include sulfuric acid, polychlorinated biphenyls (PCBs), ethylene glycol, and hydrochloric acid.

**Figure 2. Most commonly released substances, Missouri 1994 - 1998.**



**Figure 3. Substances released, Missouri 1994-1998.**



## VICTIMS

A total of 151 victims sustained single or multiple injuries in 66 (6.2%) events involving an actual release. Of these, 40 (60.6%) involved only one victim (Table 9). Most of the victims (111, or 73.5%) were injured in fixed-facility events. Table 10 illustrates that the substances released most frequently are not necessarily the most likely to cause injuries.

**Table 9**  
**Number of Victims by Type of Event**  
**Missouri 1994 – 1998**

No. of Victims	TYPE OF EVENT						All Events		
	Fixed-Facility			Transportation					
	No. of Events	%	No. of Victims	No. of Events	%	No. of Victims	No. of Events	%	No. of Victims
1	25	58.1	25	15	65.2	15	40	60.6	40
2	8	18.6	16	3	13.0	6	11	16.7	22
3	3	7.0	9	3	13.0	9	6	9.1	18
4	4	9.3	16	0	0.0	0	4	6.1	16
5	1	2.3	5	2	8.7	10	3	4.5	15
≥ 6	2	4.7	40	0	0.0	0	2	3.0	40
Total *	43	100.0	111	23	99.9	40	66	100.0	151

**Table 10**  
**Number of Substances Released in All Events\*\* and**  
**Events with Victims by Substance Category**  
**Missouri 1994 – 1998**

Substance Category	No. of Releases		No. of Releases with Victims		Percentage of Releases with Victims
		%		%	
Chlorine	14	1.2	5	6.3	35.7
Bases	45	3.8	6	7.6	13.3
Ammonia	136	11.5	14	17.7	10.3
Acids	135	11.4	11	13.9	8.1
Other inorganic substances	200	17.0	13	16.5	6.5
Paints and dyes	42	3.6	2	2.5	4.8
Mixtures ***	67	5.7	3	3.8	4.5
Pesticides	113	9.6	5	6.3	4.4
Volatile organic compounds	116	9.8	3	3.8	2.6
Polychlorinated biphenyls	47	4.0	0	0.0	0.0
Other substances	264	22.4	17	21.5	6.4
<b>Total * ****</b>	<b>1,179</b>	<b>100.0</b>	<b>79</b>	<b>99.9</b>	<b>6.7</b>

\* Percentage may not equal 100.0 due to rounding to the nearest decimal point

\*\* Does not include threatened only events, as no substances were actually released during these events

\*\*\* Mixtures of substances from different categories

\*\*\*\* Exceeds total number of events with releases (1,060) because events at which more than one substance was released were counted more than once

The types of injuries sustained by victims are shown in Table 11 and Figure 4. The most common types of injuries reported in fixed-facility events were respiratory irritation, eye irritation, and gastrointestinal symptoms. In transportation related events, trauma and respiratory irritation were reported most frequently.

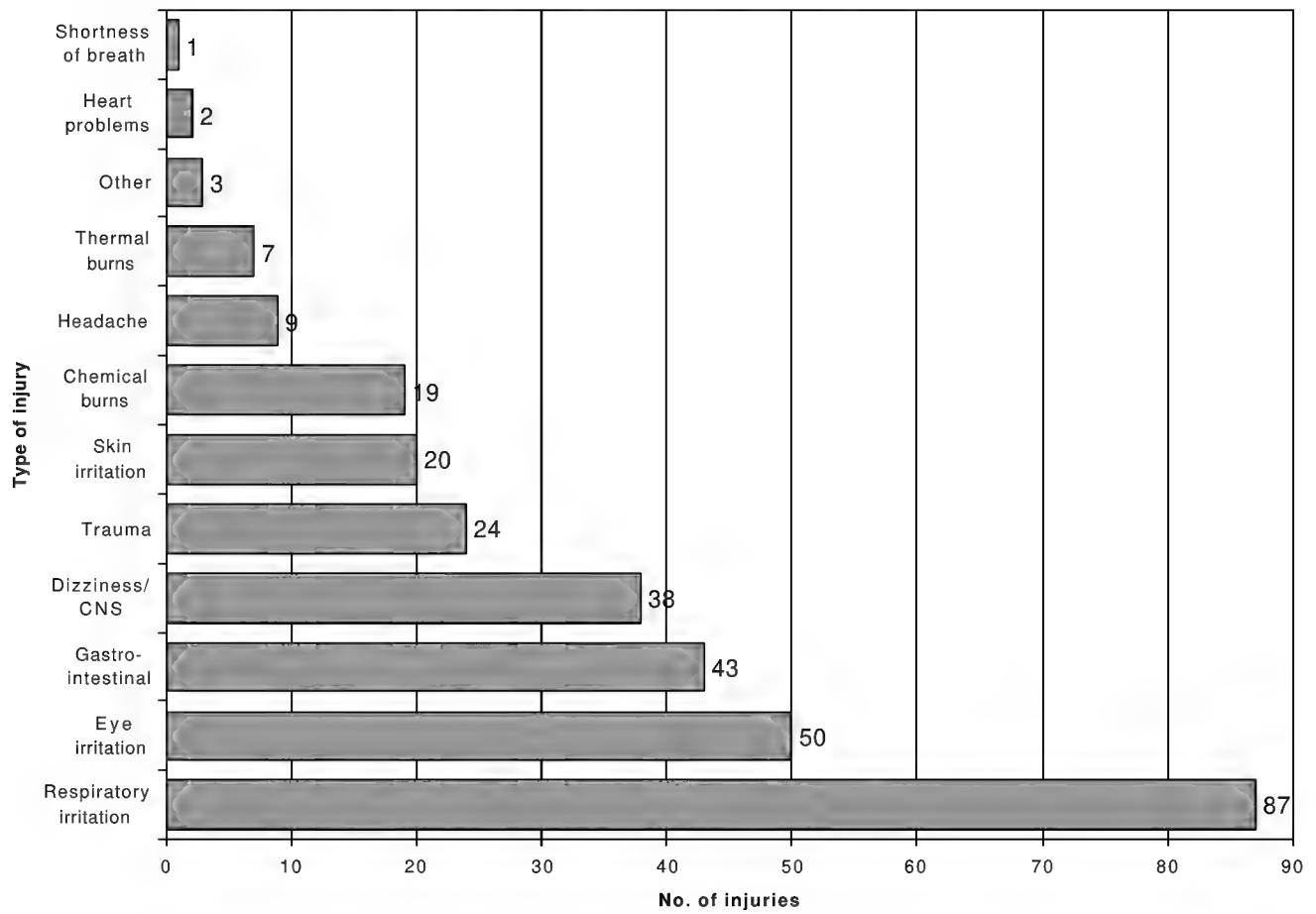
**Table 11**  
**Type of Injury by Type of Event**  
**Missouri 1994 – 1998**

Type of Injury	TYPE OF EVENT				All Events	
	Fixed-Facility		Transportation			
	No. of Injuries	%	No. of Injuries	%	No. of Injuries	%
Chemical burns	13	5.4	6	9.5	19	6.3
Dizziness/central nervous system	35	14.6	3	4.8	38	12.5
Eye irritation	43	17.9	7	11.1	50	16.5
Gastrointestinal	41	17.1	2	3.2	43	14.2
Headache	3	1.3	6	9.5	9	3.0
Heart problems	2	0.8	0	0.0	2	0.7
Respiratory irritation	74	30.8	13	20.6	87	28.7
Shortness of breath	0	0.0	1	1.6	1	0.3
Skin irritation	13	5.4	7	11.1	20	6.6
Thermal burns	6	2.5	1	1.6	7	2.3
Trauma	8	3.3	16	25.4	24	7.9
Other	2	0.8	1	1.6	3	1.0
Total *	240	99.9	63	100.0	303 **	100.0

\* Percentage may not equal 100.0 due to rounding to the nearest decimal point

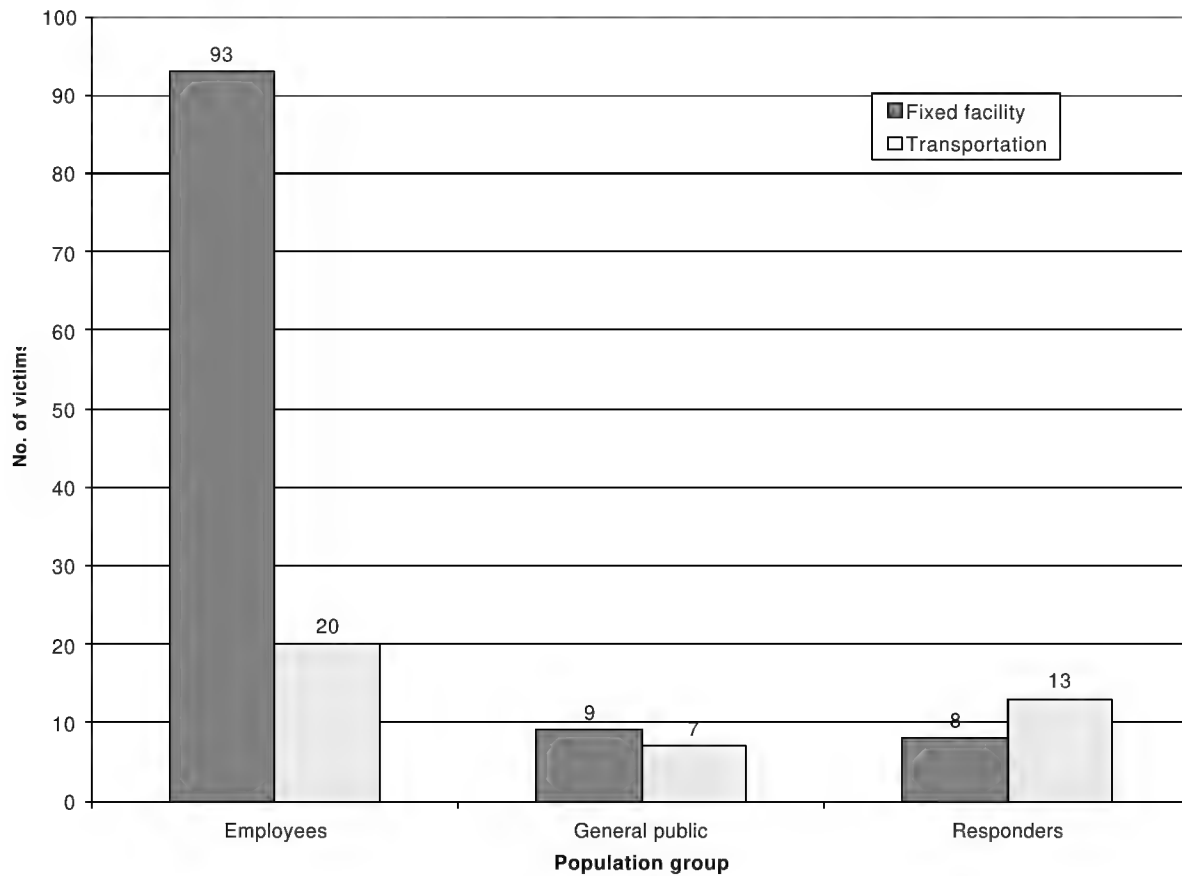
\*\* Exceeds the total number of victims (151) because some victims had more than one injury

**Figure 4. Type of injury for all events, Missouri 1994-1998.**



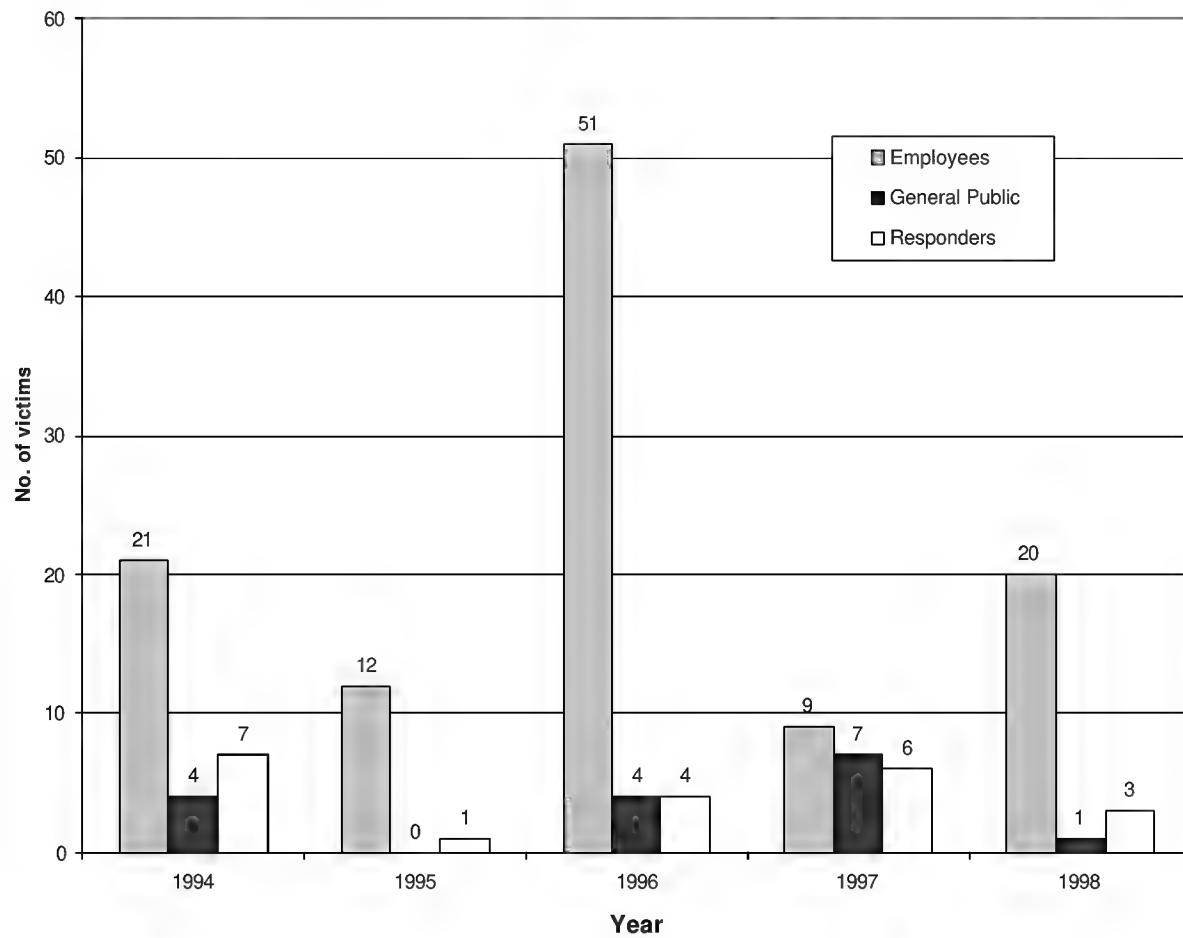
The population group injured the most often were employees and responders (Figures 5 and 6). Of the eight responders injured in fixed-facility events, four were professional firefighters, two were volunteer firefighters, and two were police officers (Figure 7). Thirteen responders were injured in transportation events; however, the responder type is only known for one victim.

**Figure 5. Victims by population group\* and type of event, Missouri 1994-1998.**



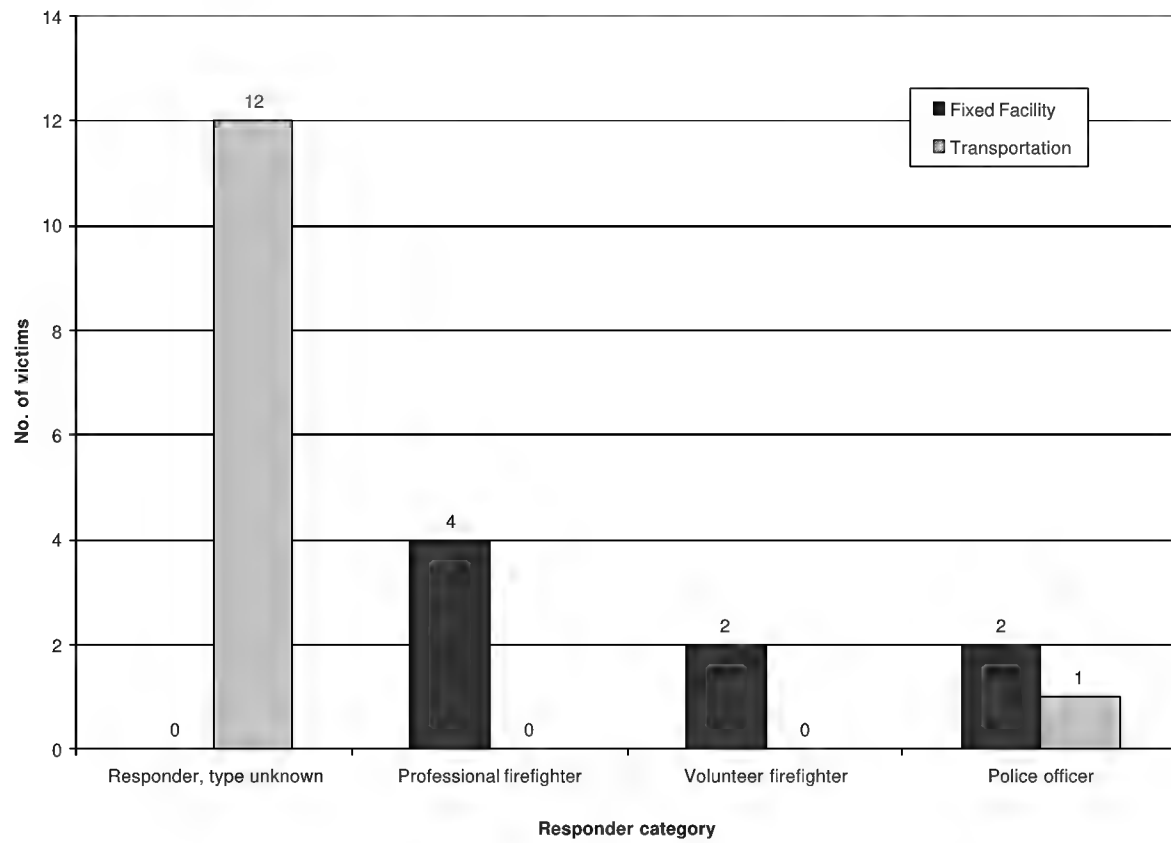
\*There was one victim in a fixed-facility event for whom the population group was not known

**Figure 6. Victims by population group\* for all events, Missouri 1994-1998.**



\*There was one victim in a fixed-facility event for whom the population group was not known

**Figure 7. Responder victims by population group and type of event, Missouri 1994-1998.**



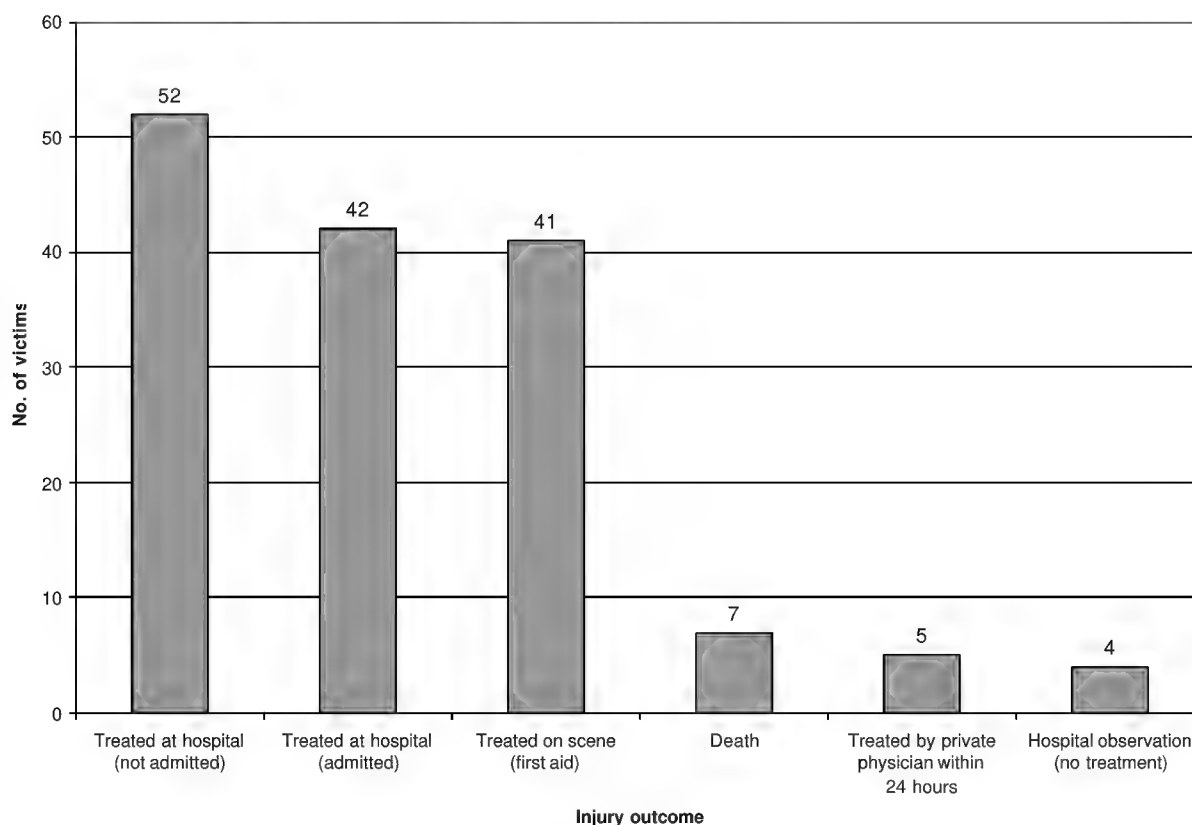


Of the 151 victims, 52 (34.4%) were treated at a hospital but were not admitted (Figure 8). Forty-two victims (27.8%) were treated at a hospital and admitted, while 41 victims (27.2%) were treated on the scene. Seven events resulted in seven deaths. All of the individuals who died were employees.

Four deaths occurred due to trauma sustained during motor vehicle accidents in which hazardous substances were released. One death occurred when an employee was struck when he opened the door on a pressurized oven and was struck by the door. One employee died as a result of trauma from shrapnel after an explosion at an explosives incinerator.

Only one death was due to actual exposure to a hazardous substance. An employee of a barge company died of chemical suffocation when an unknown amount of residual anhydrous ammonia was released from a transfer hose when he and two other employees were transferring the product to a barge.

**Figure 8. Injury outcomes, Missouri 1994-1998.**



## EVACUATIONS

Evacuations were ordered by an official in 98 (9.2%) events. Seventy-one evacuations involved a total of 11,296 people (Table 12). The number of people evacuated in 27 events is unknown. The event with the largest number of persons evacuated occurred when a tire fire caused the release of an unknown quantity of magnesium. The close proximity of 3,000 gallons of propane and a 30,000-gallon tank of methanol, as well as air pollution from the burning tires, prompted the evacuation of approximately 3,000 people within a one-mile radius of the event.

**Table 12**  
**Evacuations Ordered and Number Evacuated**  
**Missouri 1994 - 1998**

	1994	1995	1996	1997	1998	Total
<b>Number of Evacuations</b> (number of evacuees known)	24	11	8	10	18	<b>71</b>
<b>Number of Evacuations</b> (number of evacuees unknown)	5	6	4	7	5	<b>27</b>
<b>Total Evacuations</b>	29	17	12	17	23	<b>98</b>
<b>Total People Evacuated</b>	1,543	1,609	1,830	1,553	4,761	<b>11,296</b>
<b>Largest Evacuation</b>	300	400	1,200	800	3,000	<b>N/A</b>

During 14 additional events, individuals left their home or place of business but an official did not issue an evacuation order. The number of people who left the area was not known for any of these events.

Of the 98 evacuations ordered by an official, 62 (63.3%) involved the building or affected part of the building where the event occurred, 15 (15.3%) were within a specified radius of the release, 15 (15.3%) were downwind, and 2 (2.0%) were within both a specified radius and downwind. Four evacuations (4.1%) were ordered with no defined criteria for the evacuated area (Table 13).

**Table 13**  
**HSEES Events by Evacuation Criteria**  
**Missouri 1994 - 1998**

Criteria	1994	1995	1996	1997	1998	Total
<b>Building</b>	22	10	6	11	13	<b>62</b>
<b>Defined radius</b>	3	3	0	4	5	<b>15</b>
<b>Downwind</b>	2	3	5	2	3	<b>15</b>
<b>No criteria given</b>	2	1	0	0	1	<b>4</b>
<b>Radius/downwind</b>	0	0	1	0	1	<b>2</b>
<b>Total</b>	29	17	12	17	23	<b>98</b>

## SUMMARY

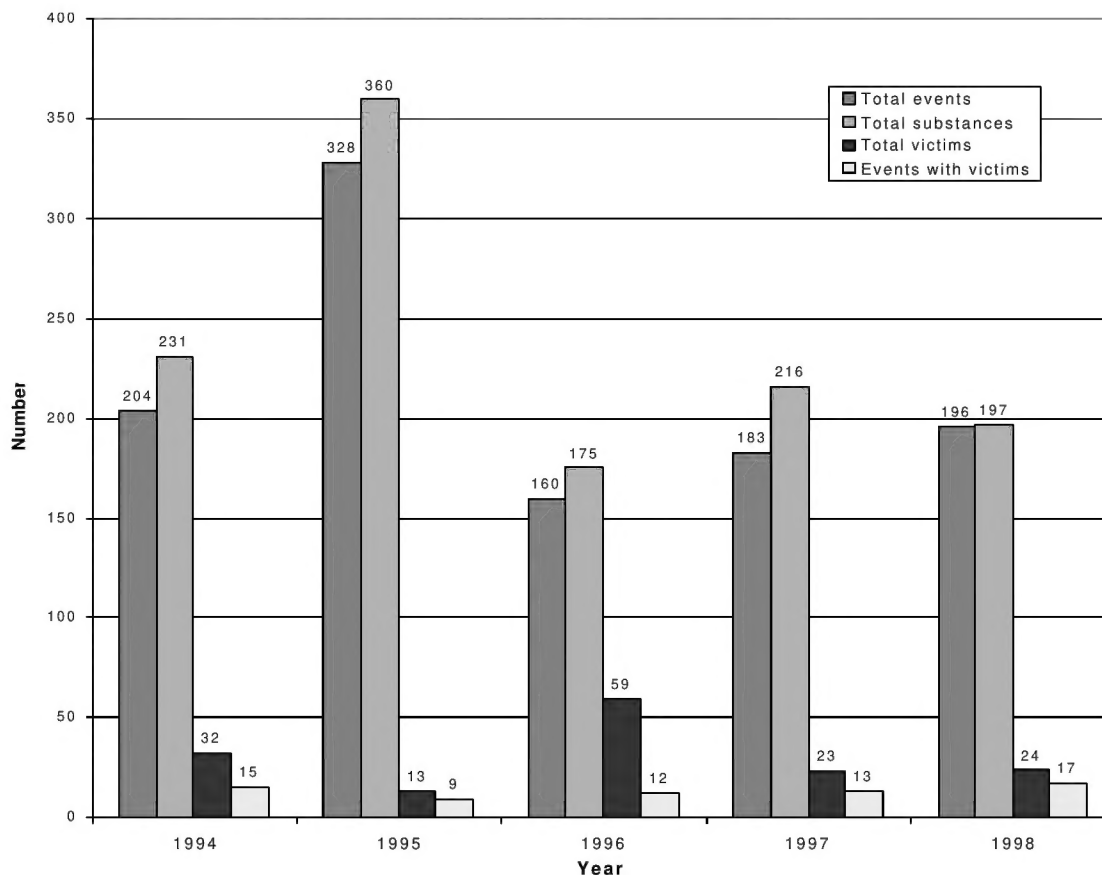
The number of events, substances released, number of deaths, number of victims, and percentage of events with victims is summarized in Table 14 by calendar year. Cumulative data is also illustrated in bar graph format (Figure 9).

**Table 14: Summary of Events, Substances Released, Number of Deaths, Number of Victims, and Percentage of Events with Victims  
Missouri 1994-1998**

Year	TYPE OF EVENT			No. of Substances Released *	No. of Deaths	No. of Victims	Events with Victims	
	Fixed-Facility	Trans- portation	Total				#	%
1994	137	67	204	231	1	32	15	7.4
1995	172	156	328	360	1	13	9	2.9
1996	109	51	160	175	2	59	12	6.9
1997	113	70	183	216	1	23	13	7.1
1998	145	51	196	197	2	24	17	8.7
<b>TOTAL</b>	<b>676</b>	<b>395</b>	<b>1,071</b>	<b>1,179</b>	<b>7</b>	<b>151</b>	<b>66</b>	<b>6.2</b>

\* Does not include substances in threatened only events, as no substances were actually released

**Figure 9: Cumulative data for Missouri, 1994-1998.**



## Discussion

- Missouri is a state with several metropolitan areas (St. Louis, Kansas City and Springfield). It is not surprising that 553 (51.6%) of the 1,071 events reported during this five-year period occurred counties adjacent to or included in these areas. However, three non-metropolitan counties in the top 10 accounted for 115 (10.7%) events. It appears that surveillance should be enhanced in non-metropolitan areas where large manufacturers and/or transportation hubs are located to better meet the needs of counties with limited resources.
- Ammonia releases continue to be a problem in Missouri, some of which are the result of illegal methamphetamine manufacturers utilizing clandestine methods to gather ammonia from storage areas. These events, plus events resulting from legitimate manufacturers and consumers of ammonia products, are an area of concern.
- Reported mercury spills increased in Missouri from two in 1994 to twelve in 1998. This demonstrates a need to educate users such as schools, clinics and local public health agencies concerning the potential risks of mercury released from devices such as blood pressure machines (particularly older models) and thermometers. Better education of industrial users is also needed.
- The threat of chemical terrorism exists within Missouri, just as it does throughout the rest of the United States. This threat will most likely increase, as dissident groups resort to more unconventional and radical methods to try to accomplish their objectives. Some groups within Missouri may try to further their goals by alerting public health officials to the possibility of a release, even if they do not have sufficient material or resources to follow through. Evacuations from these threatened releases may cause injury and will engage resources needed in other critical areas. The ability to analyze what proportion of threatened releases actually occurs and why the releases occurred will be critical. It is imperative that the infrastructure needed to support this type of surveillance and analysis is expanded upon.
- The Missouri Department of Health's commitment to expansion of environmental and other forms of surveillance has been paralleled by its development and operationalization of strategic planning initiatives that drive programmatic, quality assurance and budgetary processes. The department's strategic plan contains goals and objectives that specifically address: epidemiologic support for the design and evaluation of surveillance systems; improved capabilities of and access to geographic information systems; increasing the number of hospitals and physicians reporting environmentally induced illness; improving access of surveillance data and electronic reporting to local public health agencies; and designing surveillance systems that monitor the health of people who live around hazardous waste sites or who are exposed to environmental spills. Activities such as these will serve to protect the health of all Missourians from environmental threats.

## Recommendations

- Develop and implement prevention strategies to reduce the number of hazardous substance events, in addition to decreasing the number and severity of injuries when events occur. Continuously evaluate the effectiveness of activities that have been completed.
- Annually analyze data on a county basis and disseminate the information to hospitals, fire and police departments, hospitals, local public health agencies, local emergency planning committees, and other interested parties to increase awareness of events in local areas.
- Work with hospitals in the St. Louis and Kansas City metropolitan areas to report possible HSEES events when individuals with symptoms of chemical exposure (e.g., chemical burns, respiratory irritation, and eye irritation) present for medical treatment. Develop similar working relationships with other hospitals in the state if this initiative is successful in these two major metropolitan areas.
- Develop a sentinel network of emergency rooms, fire departments, and police departments in the ten counties with the highest number of events in the last five years.
- The Missouri Department of Health has developed and is implementing a computerized method of conducting statewide, integrated surveillance for communicable diseases, environmental threats, and other factors that adversely affect the public's health. This system is called the Missouri Health Surveillance Information System (MOHSIS). It is recommended that reporting of HSEES events be incorporated into MOHSIS. This would eventually allow personnel in local public health agencies throughout Missouri to report, analyze and use information from HSEES events.
- Recommend expanding the MOHSIS network to include (in addition to local public health agencies): physicians' offices (including those that specialize in treatment of environmental conditions); clinics; hospitals (especially emergency rooms, where victims of chemical terrorism might first be evaluated); and employee health offices of businesses that, because of their size or the types of operations they conduct, present a potential hazard to employees or customers (as from chemical spills).
- Work with terrorism coordinators (department, state, federal) to share resources, sentinel networks, and local contacts.